

From the INTERNATIONAL BUREAU

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Commissioner  
US Department of Commerce  
United States Patent and Trademark  
Office, PCT  
2011 South Clark Place Room  
CP2/5C24  
Arlington, VA 22202  
ETATS-UNIS D'AMERIQUE  
in its capacity as elected Office

Date of mailing (day/month/year) 23 February 2001 (23.02.01)	
International application No. PCT/GB00/02781	Applicant's or agent's file reference P006791WO KMB
International filing date (day/month/year) 19 July 2000 (19.07.00)	Priority date (day/month/year) 19 July 1999 (19.07.99)
Applicant LAMBERT, Philip, John	

1. The designated Office is hereby notified of its election made:

☒

in the demand filed with the International Preliminary Examining Authority on:

15 January 2001 (15.01.01)☐

in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was☐

was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Juan Cruz Telephone No.: (41-22) 338.83.38
---	---

## PCT

NOTIFICATION OF THE RECORDING  
OF A CHANGE(PCT Rule 92bis.1 and  
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

BODEN, Keith, McMurray  
D Young & Co.  
21 New Fetter Lane  
London EC4A 1DA  
ROYAUME-UNIDate of mailing (day/month/year)  
18 January 2002 (18.01.02)Applicant's or agent's file reference  
P006791WO KMB

## IMPORTANT NOTIFICATION

International application No.  
PCT/GB00/02781International filing date (day/month/year)  
19 July 2000 (19.07.00)

## 1. The following indications appeared on record concerning:

☒ the applicant ☐ the inventor ☐ the agent ☐ the common representative

## Name and Address

DEK PRINTING MACHINES LIMITED

## State of Nationality

GB

## State of Residence

GB

Telephone No.

Facsimile No.

Teleprinter No.

## 2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☒ the person ☐ the name ☐ the address ☐ the nationality ☐ the residence

## Name and Address

DEK INTERNATIONAL GmbH  
Geroldstrasse 28  
4 Stock, PO Box 240  
CH 8037, Zurich  
Switzerland

## State of Nationality

CH

## State of Residence

CH

Telephone No.

Facsimile No.

Teleprinter No.

## 3. Further observations, if necessary:

## 4. A copy of this notification has been sent to:

☒ the receiving Office ☐ the designated Offices concerned  
☐ the International Searching Authority ☒ the elected Offices concerned  
☐ the International Preliminary Examining Authority ☐ other:The International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland

Authorized officer

Ki-Nam HA

Facsimile No.: (41-22) 740.14.35

Telephone No.: (41-22) 338.83.38

(19) World Intellectual Property Organization  
International Bureau



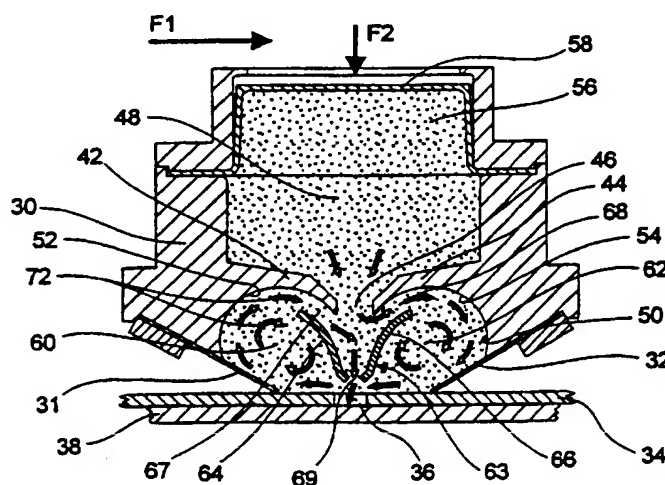
(43) International Publication Date  
25 January 2001 (25.01.2001)

PCT

(10) International Publication Number  
WO 01/05592 A1

- (51) International Patent Classification<sup>7</sup>: B41F 15/46, H05K 3/12
- (21) International Application Number: PCT/GB00/02781
- (22) International Filing Date: 19 July 2000 (19.07.2000)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
9916906.2 19 July 1999 (19.07.1999) GB
- (71) Applicant (for all designated States except US): DEK PRINTING MACHINES LIMITED [GB/GB]; 11 Albany Road, Granby Industrial Estate, Weymouth, Dorset DT4 9TH (GB).
- (72) Inventor; and  
(75) Inventor/Applicant (for US only): LAMBERT, Philip, John [GB/GB]; 5 Pugmill Lane, Chickerell, Weymouth, Dorset DT3 4PB (GB).
- (74) Agent: BODEN, Keith, McMurray; D Young & Co., 21 New Fetter Lane, London EC4A 1DA (GB).
- (81) Designated States (national): CA, JP, US.
- (84) Designated States (regional): European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).
- Published:  
— With international search report.
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: IMPROVEMENTS RELATING TO SCREEN PRINTING



(57) Abstract: A screen printing head for a method of applying a pasty product to a printing screen, the printing head comprising: a main body (30); wiper blades (31, 32) disposed to the main body for contacting a printing screen (34); a first chamber (48) providing a reservoir for containing a supply of pasty product, the first chamber being defined at least in part by the main body and including at least one outlet opening (46) through which pasty product is in use forced under pressure; a second chamber (50) in fluid communication with the at least one outlet opening, the second chamber being defined in part by the main body and the wiper blades and being in use in communication with the printing screen; and a flow director (63) disposed in the second chamber and configured such as in use to cause a circulatory flow of pasty product contained therein which passes over the surface of the printing screen and a flow of pasty product towards the printing screen which acts to force pasty product of the circulatory flow towards the printing screen and into apertures therein.

WO 01/05592 A1

### IMPROVEMENTS RELATING TO SCREEN PRINTING

The present invention relates to screen printing and particularly to screen printing in which pasty product to be printed is contained within a screen printing head and delivered through the printing head by applied pressure.

It is an established technique in the assembly of printed circuit boards to deposit solder paste where connections are to be made with components, place the components on the paste deposits, and then heat the assembly to re-flow the paste and complete the connections. Screen printing machines have been used to deposit solder paste onto printed circuit boards through the apertures of a stencil or screen.

Solder paste consists of metallic microspheres of solder joined by an organic material or flux. The metallic content of such solder paste typically makes up 50 % of the volume, and up to 90 % of the weight of the paste. The viscous flux consists of rheologic agents, adhesive agents and cleaning agents, some of which are thixotropic and others of which are volatile solvents. The thixotropic property of the solder paste has the effect that relative movement of regions within the paste causes a process of shear thinning to locally reduce the viscosity of the paste.

A typical print will comprise a multiplicity of small blocks of solder paste, and for consistent quality it is essential that each block contains the same proportions of each constituent material. This requires a consistent homogeneous distribution of the materials within the solder paste.

In one traditional screen printing technique, as illustrated in Figure 1, an inclined squeegee 1 is used to push a volume of a pasty product 2 over a stencil 3 which includes apertures 4 and is located above a circuit board 5, thereby filling the apertures 4 in the stencil 3 and providing a deposit on the circuit board 5. Forward movement of the squeegee 1, with a horizontal force F1, causes a downward force F2 to be applied to the pasty product 2. This downward force F2 forces the pasty product 2 into the apertures 4 in the stencil 3, and in

conjunction with the adhesion of the pasty product 2 to the stencil 3 causes the pasty product 2 to roll across the stencil 3 as depicted by arrows 6, thereby shear thinning the pasty product 2.

There are many problems associated with this screen printing technique. One problem is that exposure of the pasty product 2 to the atmosphere results in evaporation of the solvents of the pasty product 2 and hence drying of the pasty product 2. Another problem is that increasing the speed of the squeegee 1 to increase the downward force  $F_2$  which forces the pasty product 2 into the apertures 4 of the stencil 3, not only reduces the time available to fill the apertures 4, but can also cause the pasty product 2 to slide across the stencil 3, thereby reducing the rolling effect and hence the shear thinning.

Screen printing heads have been proposed, for example as disclosed in US-A-4622239, which enclose the pasty product to overcome the problems of evaporation, but these printing heads have not addressed the problem of setting a suitable print speed.

WO-A-90/20088 discloses a screen printing head which attempts to overcome both the problems of evaporation and the setting of the print speed by applying a pressure directly to the pasty product. However, this printing head does not provide for a rolling action of the pasty product and hence shear thinning of the same. Furthermore, this printing head requires a very high pressure to be applied to the pasty product. This high pressure can result in the separation of the metallic and flux components of solder pastes which results in inconsistent printing.

WO-A-98/16387 discloses a screen printing head which has been developed partially in response to the known problems of evaporation and the setting of the print speed. As illustrated in Figure 2, this printing head comprises a main body 10, first and second wiper blades 11, 12, which contact a stencil 13 and together with the main body 10 define a chamber 15 containing a pasty product 16, a grille 17 located at the lower end of the main body 10, and a piston 18 for applying a downward force  $F_2$  on the pasty product 16. The stencil 13, which includes a plurality of apertures 19, is located above a circuit board 20

onto which deposits of the pasty product 16 are to be printed. In use, the printing head is moved in one of two opposite printing directions, with a horizontal force  $F1$ , which causes the wiper blades 11, 12, which are pressed against the stencil 13 by the force imparted on the pasty product 16 by the piston 18, to act to lift the pasty product 16 from the region above the stencil 13 and cause the pasty product 16 to pass upwardly through the grille 17, which pasty product 16 is subsequently forced back downwardly through the grille 17 by the action of the pressure developed by the piston 18. This rolling action of the pasty product 16, as depicted by arrows 21, shear thins the pasty product 16 and thereby enables the pressure  $F2$  applied by the piston 18 to be maintained at a low level and also prevents separation of the components of the pasty product 16 by the mixing effect of the rolling action. Further, the pressure  $F2$  applied to the pasty product 16 is independent of the speed of movement of the printing head.

Whilst this printing head provides for much improved screen printing, it has been established that in some circumstances this printing head does not provide for sufficient shear thinning of the pasty product 16 as necessary for a perfect print.

In the screen printing process, as illustrated in Figure 3a, incomplete filling of the stencil apertures 19 can result where the pasty product 16 is not sufficiently thinned. Where the stencil apertures 19 are incompletely filled, the action of the trailing wiper blade 11 can shear the pasty product 16 over the stencil apertures 19, with the result that the pasty product 16 in the apertures 19 is pushed to one, the forward, end of the apertures 19, as illustrated in Figure 3b, resulting in only a partial print. In an extreme case, the remaining pasty product 16 in the stencil apertures 19 may not be in sufficient contact with the circuit board 20 such that when the circuit board 20 and the stencil 13 are separated, the pasty product 16 is insufficiently adhered to the circuit board 20 and remains in the stencil 13, as shown in Fig 3c, resulting in virtually no print at all. Furthermore, the retention of pasty product 16 in apertures 19 of the stencil 13 can itself lead to problems with subsequent prints since, as mentioned hereinabove, the pasty product 16 is prone to drying out and the drying out of pasty product 16 in the apertures 19 will give rise to printing problems. These problems have been made worse by recent trends in miniaturisation which have led

to the use of smaller stencil apertures 19, which minaturization reduces the area of pasty product to circuit board contact relative to the area of pasty product to aperture wall contact.

Accordingly, the present invention provides a screen printing head for applying a pasty product to a printing screen, comprising: a main body; wiper blades disposed to the main body for contacting a printing screen; a first chamber providing a reservoir for containing a supply of pasty product, the first chamber being defined at least in part by the main body and including at least one outlet opening through which pasty product is in use forced under pressure; a second chamber in fluid communication with the at least one outlet opening, the second chamber being defined in part by the main body and the wiper blades and being in use in communication with the printing screen; and a flow director disposed in the second chamber and configured such as in use to cause a circulatory flow of pasty product contained therein which passes over the surface of the printing screen and a flow of pasty product towards the printing screen which acts to force pasty product of the circulatory flow towards the printing screen and into apertures therein.

Such a printing head provides for enhanced shear thinning of the pasty product filled into the apertures of the printing screen and hence improved stencil aperture filling to reduce the incidence of poor quality printing.

Preferably, the at least one outlet opening comprises an elongate slot.

Preferably, the flow director is further configured such as to define first and second circulation zones in which pasty product is locally circulated and through which the circulatory flow is directed.

Preferably, the flow director comprises vanes, with the circulatory flow in use passing beneath lower edges of the vanes.

More preferably, the flow director comprises first and second vanes disposed on opposed sides of the at least one outlet opening, with the lower edges of the vanes defining a nozzle directed towards the printing screen.

Preferably, the nozzle is an elongate nozzle.

Preferably, the main body includes first and second lobe members which in part define the second chamber, the lobe members being disposed above respective ones of the wiper blades and having arcuate lower surfaces to promote the circulatory flow.

In one embodiment the main body includes one or more ports through which the first chamber can be charged with pasty product.

In another embodiment the main body includes a replaceable cassette which defines at least in part the first chamber, the first chamber being charged by replacement of the cassette.

Preferably, the wiper blades comprise flexible wiper blades.

The present invention also extends to a screen printing apparatus comprising the above-described printing head.

The present invention also provides a method of screen printing using a screen printing head including a chamber in communication with the printing screen, comprising the steps of: providing a circulatory flow of pasty product in the chamber which passes over the surface of the printing screen; and providing a flow of pasty product towards the printing screen which acts to force pasty product of the circulatory flow onto the printing screen and into apertures therein.

Preferably, the method further comprises the step of locally circulating pasty product in first and second circulation zones through which the circulatory flow is directed.



The present invention further provides a printing head for screen printing, through which printing head pasty product to be printed can be pressed by applied pressure, comprising a chamber into which pasty product can be charged and in which the same can be placed under pressure, an exit slot from the chamber for pasty product to be printed and a downstream chamber in communication with the exit slot, wherein the downstream chamber is closed at an exit end thereof in use by flexible wiper blades and by a portion of a screen through which the pasty product is to be printed, and the downstream chamber is subdivided by vanes to define pasty product flow paths along which pasty product will flow as a result of movement of the printing head over the stencil in use, the flow paths comprising circulating flow above the wiper blades and flow towards the stencil between the vanes as a result of the circulating flows and movement of the pasty product through the exit slot due to the applied pressure.

The present still further provides a method of screen printing using a printing head, through which printing head pasty product to be printed is pressed by applied pressure, comprising the steps of charging pasty product into a chamber and placing the same under pressure for movement towards an exit slot from the chamber and into a downstream chamber in communication with the exit slot, the downstream chamber being closed at an exit end thereof by flexible wiper blades and by a portion of a screen through which the pasty product is to be printed, subdividing the downstream chamber by vanes to define pasty product flow paths along which pasty product flows as a result of movement of the printing head over the stencil, the flow paths comprising circulating flow above the wiper blades and flow towards the stencil between the vanes as a result of the circulating flows and movement of the pasty product through the exit slot due to the applied pressure.

A preferred embodiment of the present invention will now be described hereinbelow by way of example only with reference to the accompanying drawings, in which:

Figure 1 illustrates a sectional view through a squeegee as employed in a traditional screen printing technique;

Figure 2 illustrates a sectional view through a known screen printing head;

Figures 3a, 3b and 3c show the development of defects which can occur during screen printing using the printing head of Figure 2;

Figure 4 illustrates a perspective view of a screen printing head in accordance with a preferred embodiment of the present invention;

Figure 5 illustrates a sectional view through the printing head of Figure 4; and

Figure 6 illustrates a sectional view through the printing head of Figure 4 when in operation.

The screen printing head comprises a main body 30, in this embodiment an elongate body, and first and second inwardly and downwardly directed wiper blades 31, 32 which are clamped to the main body 30 by respective clamping plates and screws. As illustrated in Figures 5 and 6, the wiper blades 31, 32 are in use maintained in contact with a stencil 34, which includes a plurality of apertures 36 and is located above a workpiece 38, in this embodiment a circuit board, onto which deposits of a pasty product are to be printed. In this embodiment the printing head is symmetrically arranged about the longitudinal axis thereof such as to be moveable bi-directionally.

The main body 30 includes first and second lobe members 42, 44, in this embodiment projections, between which an outlet opening 46, in this embodiment an elongate slot, is defined, and first and second chambers 48, 50 in fluid communication through the outlet opening 46. As will be described further hereinbelow, each of first and second lobe members 42, 44 has an arcuate lower, roof surface 52, 54. One, the first, of the chambers 48 provides a reservoir for containing a pasty product 56 and is defined in part by a flexible diaphragm 58 which is in use acted upon to drive pasty product 56 under pressure into the other, second chamber 50. The other, second chamber 50 provides first and

second circulation zones 60, 62 in and through which pasty product 56 is circulated as will be described further hereinbelow. In this embodiment the main body 30 includes a plurality of ports 63 for charging the first chamber 48 with pasty product 56. In this embodiment the second chamber 50 is in use totally enclosed from the atmosphere to prevent drying out of the pasty product 56. with the stencil 34 in part enclosing the second chamber 50.

The printing head further comprises a flow director 63 disposed in the second chamber 50 adjacent the outlet opening 46. The flow director 63 comprises first and second vanes 64, 66 which each extend a distance parallel to the lower surface 52, 54 of respective ones of the first and second lobe members 42, 44 adjacent the outlet opening 46 such as to define passages 67, 68 therebetween and downwardly to define a nozzle 69, in this embodiment an elongate nozzle, therebetween which is spaced rearwardly from the plane defined by the lower edges of the wiper blades 31, 32 such as to allow for a flow of the pasty product 56 therebeneath. With this configuration, the printing head is effectively divided into four sections as defined by the first chamber 48, the first and second circulation zones 60, 62 and the internal space of the flow director 63.

The printing head further comprises sealing members 70 at each of the ends thereof, which sealing members 70 are formed of a flexible material so as to conform to the wiper blades 31, 32 which deflect during printing.

In use, the printing head is brought into contact with the stencil 34 which is located above the underlying workpiece 38. A force  $F_2$  is applied to the flexible diaphragm 58 so as to pressurize the pasty product 56 in the first chamber 48 and force the same through the outlet opening 46 into the second chamber 50, the pasty product 56 being forced through the passages 67, 68 and the nozzle 69 into contact with the stencil 34. The printing head is then moved, under a horizontal force  $F_1$ , across the stencil 34, which movement in conjunction with the adhesion of the pasty product 56 to the stencil 34, causes a circulatory flow of the pasty product 56 in the circulation zones 60, 62 as depicted by arrows 72. Pasty product 56 from the leading circulation zone, in this embodiment the second

circulation zone 62, is drawn by adhesion to the stencil 34 between the nozzle 69 and the stencil 34, causing shear thinning of the pasty product 56 in this region. This flow of the pasty product 56 increases the pressure within the trailing circulation zone. In this embodiment the first circulation zone 60, and pasty product 56 is forced back to the leading circulation zone 62 through the passages 67, 68, thereby further shear thinning the pasty product 56. At the same time, the action of the pasty product 56 introduced through the outlet opening 46 into the second chamber 50 is such as to apply a pressure through the nozzle 69 directly to the freshly shear-thinned pasty product 56 in the region below the nozzle 69, forcing the shear-thinned pasty product 56 into apertures 36 in the stencil 34.

The printing head of the present invention provides for better shear thinning than any of the known printing heads, particularly in the critical region between the nozzle 69 and the stencil 34, and provides for much improved packing of pasty product 56 into the stencil apertures 36. The wiper blades 31, 32 are thus able to cleanly cut off the pasty product 56 across the top of the stencil apertures 36, without leaving any voids in the stencil apertures 36. In this way, good contact is established between the pasty product 56 and the workpiece 38 over the full area of the stencil apertures 38, thereby ensuring good separation of the pasty product 56 from the stencil 34 on separating the stencil 34 from the workpiece 38, and as a result high quality printing.

Finally, it will be understood that the present invention has been described in its preferred embodiment and can be modified in many different ways without departing from the scope of the invention as defined by the appended claims. For example, alternative designs for the first chamber 48 are clearly possible, such as an interchangeable cassette system, as disclosed, for example, in WO-A-98/16387. Also, the shape and size of the flow director 63, in particular the nozzle 69, and the first and second chambers 48, 50 can be altered from those of the illustrated embodiment. In particular, the widths of the outlet opening 46 and the nozzle 69, the width and length of the passages 67, 68, and the clearance between the lower edge of the nozzle 69 and the stencil 34, all have an effect on the operation of the printing head and can be altered to provide the desired balance between shear thinning and the maximum feed rate of the pasty product 56.

CLAIMS

1. A screen printing head for applying a pasty product to a printing screen, comprising:  
a main body;  
wiper blades disposed to the main body for contacting a printing screen;  
a first chamber providing a reservoir for containing a supply of pasty product, the first chamber being defined at least in part by the main body and including at least one outlet opening through which pasty product is in use forced under pressure;  
a second chamber in fluid communication with the at least one outlet opening, the second chamber being defined in part by the main body and the wiper blades and being in use in communication with the printing screen; and  
a flow director disposed in the second chamber and configured such as in use to cause a circulatory flow of pasty product contained therein which passes over the surface of the printing screen and a flow of pasty product towards the printing screen which acts to force pasty product of the circulatory flow towards the printing screen and into apertures therein.
2. The printing head of claim 1, wherein the at least one outlet opening comprises an elongate slot.
3. The printing head of claim 1 or 2, wherein the flow director is further configured such as to define first and second circulation zones in which pasty product is locally circulated and through which the circulatory flow is directed.
4. The printing head of any of claims 1 to 3, wherein the flow director comprises vanes, with the circulatory flow in use passing beneath lower edges of the vanes.
5. The printing head of claim 4, comprising first and second vanes disposed on opposed sides of the at least one outlet opening, with the lower edges of the vanes defining a nozzle directed towards the printing screen.

6. The printing head of claim 5, wherein the nozzle is an elongate nozzle.
7. The printing head of any of claims 1 to 6, wherein the main body includes first and second lobe members which in part define the second chamber, the lobe members being disposed above respective ones of the wiper blades and having arcuate lower surfaces so as to promote the circulatory flow.
8. The printing head of any of claims 1 to 7, wherein the main body includes one or more ports through which the first chamber can be charged with pasty product.
9. The printing head of any of claims 1 to 7, wherein the main body includes a replaceable cassette which defines at least in part the first chamber, the first chamber being charged by replacement of the cassette.
10. The printing head of any of claims 1 to 9, wherein the wiper blades comprise flexible wiper blades.
11. A screen printing apparatus comprising the printing head of any of claims 1 to 10.
12. A method of screen printing using a screen printing head including a chamber in communication with the printing screen, comprising the steps of:  
providing a circulatory flow of pasty product in the chamber which passes over the surface of the printing screen; and  
providing a flow of pasty product towards the printing screen which acts to force pasty product of the circulatory flow onto the printing screen and into apertures therein.
13. The method of claim 12, further comprising the step of locally circulating pasty product in first and second circulation zones through which the circulatory flow is directed.

14. A screen printing head for screen printing, through which printing head pasty product to be printed can be pressed by applied pressure, comprising a chamber into which pasty product can be charged and in which the same can be placed under pressure, an exit slot from the chamber for pasty product to be printed and a downstream chamber in communication with the exit slot, wherein the downstream chamber is closed at an exit end thereof in use by flexible wiper blades and by a portion of a screen through which the pasty product is to be printed, and the downstream chamber is subdivided by vanes to define pasty product flow paths along which pasty product will flow as a result of movement of the printing head over the stencil in use, the flow paths comprising circulating flow above the wiper blades and flow towards the stencil between the vanes as a result of the circulating flows and movement of the pasty product through the exit slot due to the applied pressure.
15. A method of screen printing using a printing head, through which printing head pasty product to be printed is pressed by applied pressure, comprising the steps of charging pasty product into a chamber and placing the same under pressure for movement towards an exit slot from the chamber and into a downstream chamber in communication with the exit slot, the downstream chamber being closed at an exit end thereof by flexible wiper blades and by a portion of a screen through which the pasty product is to be printed, subdividing the downstream chamber by vanes to define pasty product flow paths along which pasty product flows as a result of movement of the printing head over the stencil, the flow paths comprising circulating flow above the wiper blades and flow towards the stencil between the vanes as a result of the circulating flows and movement of the pasty product through the exit slot due to the applied pressure.

1 / 3

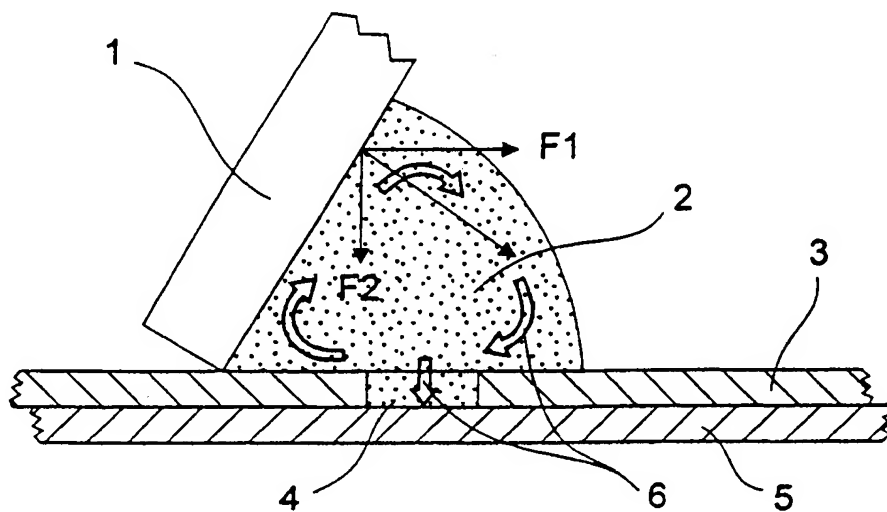


FIG. 1

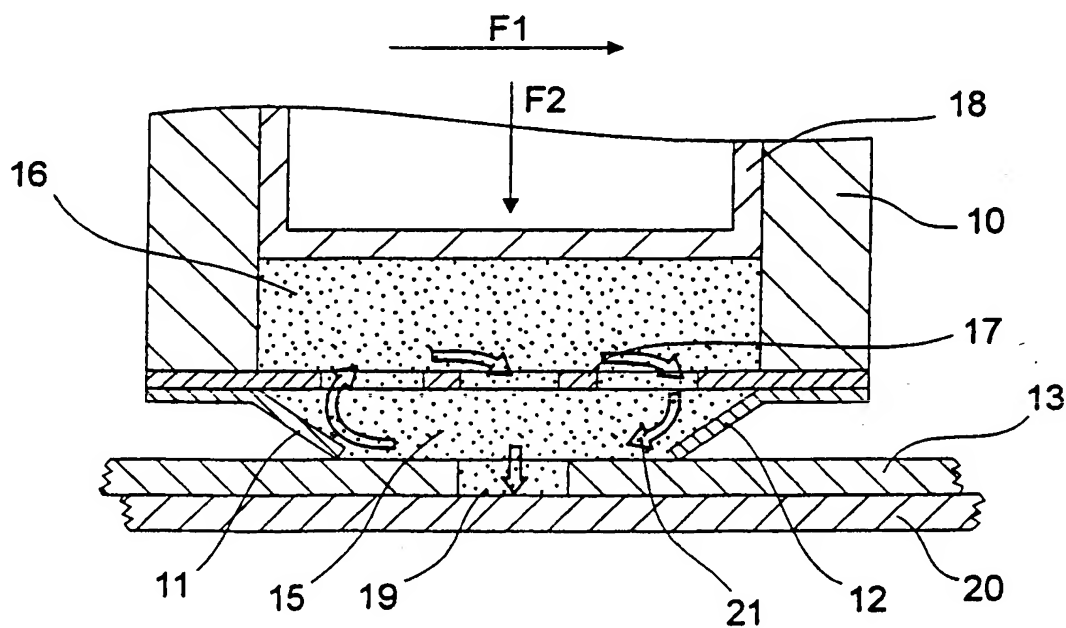


FIG. 2



2 / 3

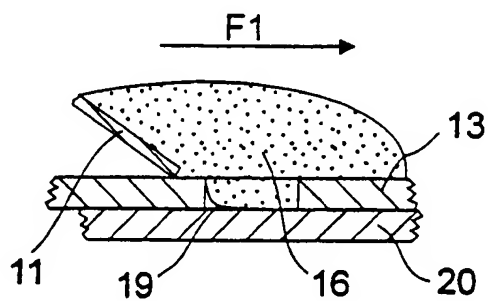


FIG. 3a

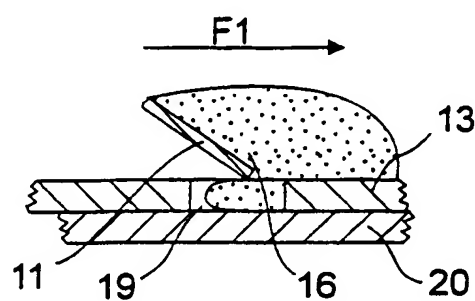


FIG. 3b

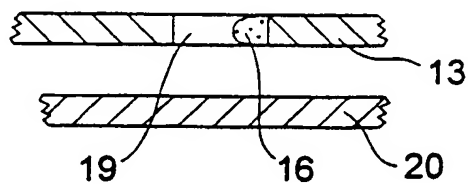


FIG. 3c

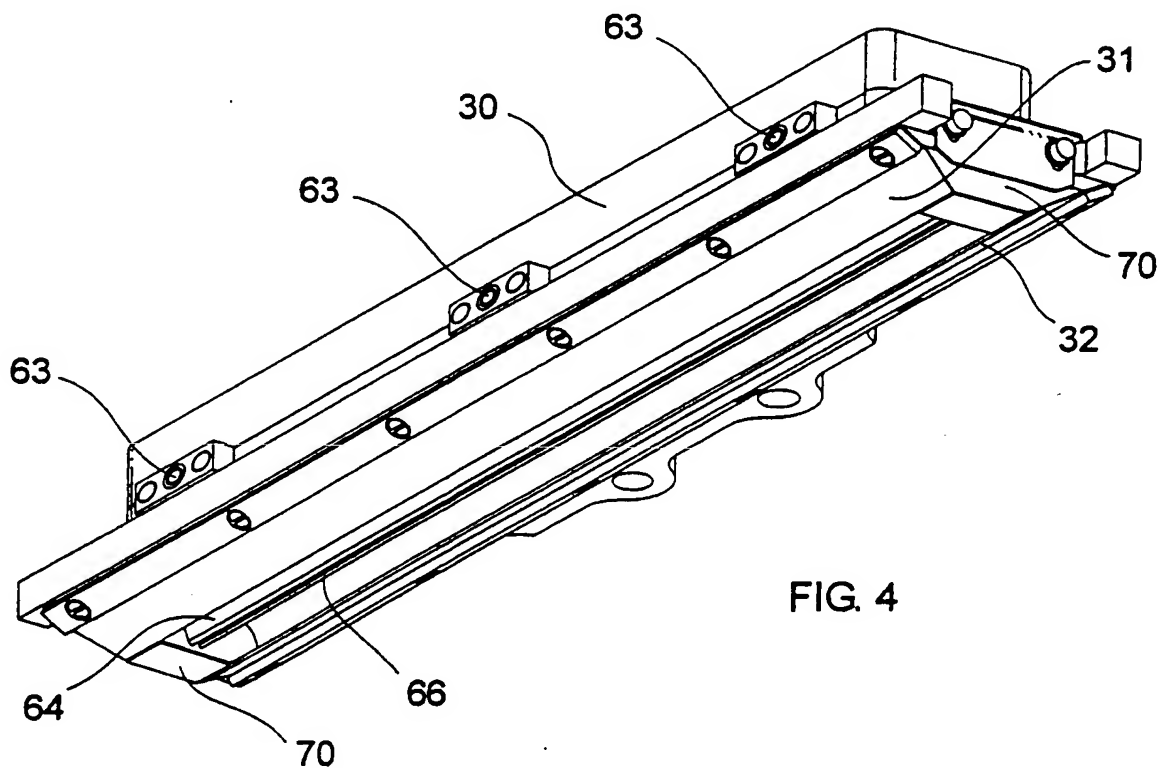


FIG. 4

3 / 3

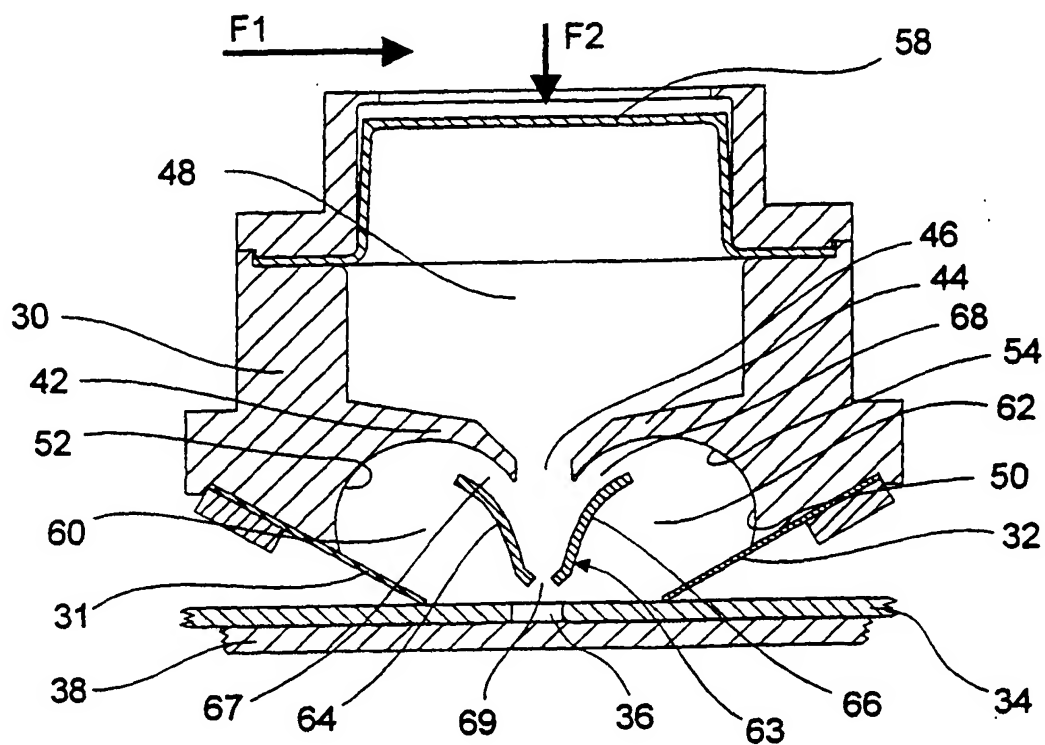


Fig. 5

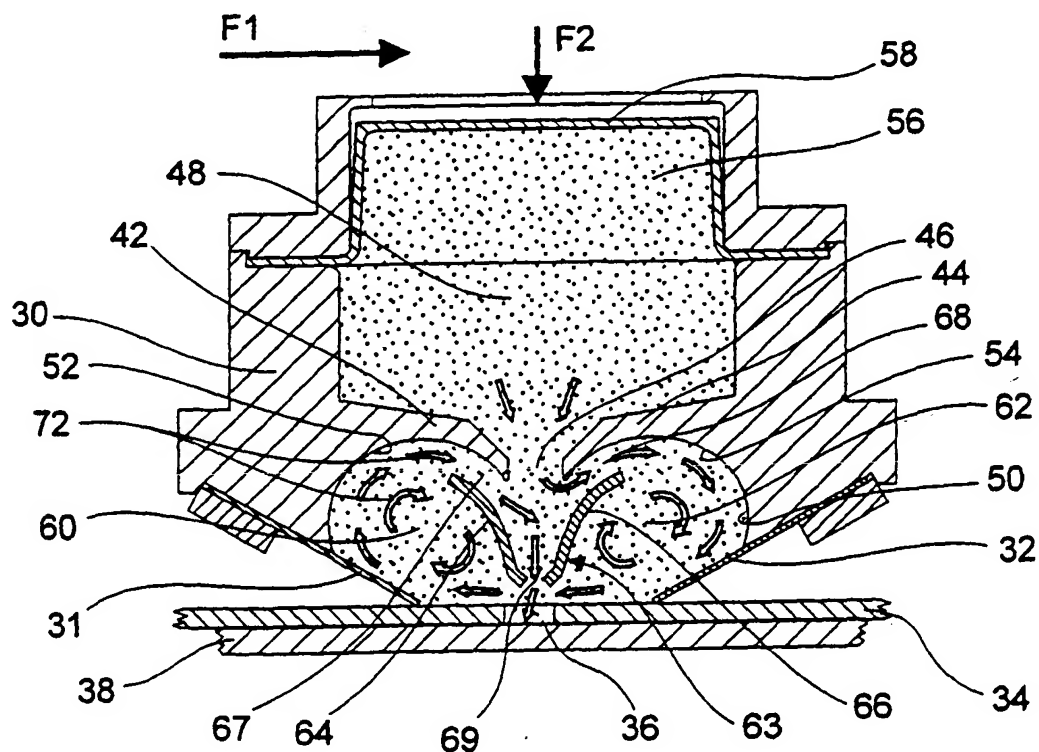


FIG. 6

# INTERNATIONAL SEARCH REPORT

Inter      Application No  
PC1, u8 00/02781

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7    B41F15/46    H05K3/12

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7    B41F    H05K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3 302 564 A (THE BRADFORD DYERS) 7 February 1967 (1967-02-07) the whole document	1, 12, 14, 15
A	FR 2 263 109 A (STORK BRABANT) 3 October 1975 (1975-10-03) the whole document	1, 12, 14, 15

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*&\* document member of the same patent family

Date of the actual completion of the international search

26 September 2000

Date of mailing of the international search report

06/10/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Loncke, J

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 3302564	A	07-02-1967	NONE	
FR 2263109	A	03-10-1975	NL 7403192 A	10-09-1975
			AT 337733 B	11-07-1977
			AT 181275 A	15-11-1976
			CH 577386 A	15-07-1976
			DE 2507370 A	11-09-1975
			GB 1486977 A	28-09-1977
			IT 1029867 B	20-03-1979
			JP 50157686 A	19-12-1975

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>P006791W0 KMB</b>	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. <b>PCT/GB 00/ 02781</b>	International filing date (day/month/year) <b>19/07/2000</b>	(Earliest) Priority Date (day/month/year) <b>19/07/1999</b>
Applicant <b>DEK PRINTING MACHINES LIMITED</b>		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 2 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

## 1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☐ the text is approved as submitted by the applicant.

☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

6

☐ None of the figures.

A. CLASSIFICATION OF SUBJECT MATTER  
 IPC 7 B41F15/46 H05 12

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B41F H05K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3 302 564 A (THE BRADFORD DYERS) 7 February 1967 (1967-02-07) the whole document	1, 12, 14, 15
A	FR 2 263 109 A (STORK BRABANT) 3 October 1975 (1975-10-03) the whole document	1, 12, 14, 15



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

26 September 2000

Date of mailing of the international search report

06/10/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
 NL - 2280 HV Rijswijk  
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
 Fax: (+31-70) 340-3016

Authorized officer

Loncke, J

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/GB 00/02781

Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

LINE 2 -...BODY(30)...BLADES(31,32)  
LINE 3 -...SCREEN(34)...CHAMBER(48)  
LINE 5 -...OPENING(46)  
LINE 6 -...CHAMBER(50)  
LINE 8 -...DIRECTOR(63)

PCT/GB 00/02781

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
US 3302564	A	07-02-1967	NONE		
FR 2263109	A	03-10-1975	NL 7403192	A	10-09-1975
			AT 337733	B	11-07-1977
			AT 181275	A	15-11-1976
			CH 577386	A	15-07-1976
			DE 2507370	A	11-09-1975
			GB 1486977	A	28-09-1977
			IT 1029867	B	20-03-1979
			JP 50157686	A	19-12-1975



# PATENT COOPERATION TREATY

From the  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

<p>To:</p> <p>BODEN, Keith D. Young &amp; CO. 21 New Fetter Lane London EC4A 1DA GRANDE BRETAGNE</p> <div style="border: 1px solid black; padding: 5px; display: inline-block;"> <p>MONEY 2</p> <p>ORDER</p> <p>DIVIDY</p> <p>20 APR 2001</p> <p>KMB</p> </div>	<h2 style="font-size: 2em; margin: 0;">PCT</h2> <p>NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT (PCT Rule 71.1)</p>
<p>Date of mailing (day/month/year) 19.04.2001</p>	
<p>Applicant's or agent's file reference P006791WO KMB</p>	
<p><b>IMPORTANT NOTIFICATION</b></p>	
<p>International application No. PCT/GB00/02781</p>	<p>International filing date (day/month/year) 19/07/2000</p>
<p>Priority date (day/month/year) 19/07/1999</p>	
<p>Applicant DEK PRINTING MACHINES LIMITED</p>	



1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

#### 4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.


<p>Name and mailing address of the IPEA/</p> <div style="text-align: center;">  <p>European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465</p> </div>	<p>Authorized officer</p> <p>Garry, A</p> <p>Tel. +49 89 2399-2375</p> <div style="text-align: right;">  </div>
---	--

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference <b>P006791WO KMB</b>	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. <b>PCT/GB00/02781</b>	International filing date ( <i>day/month/year</i> ) <b>19/07/2000</b>	Priority date ( <i>day/month/year</i> ) <b>19/07/1999</b>
International Patent Classification (IPC) or national classification and IPC <b>B41F15/46</b>		
Applicant <b>DEK PRINTING MACHINES LIMITED</b>		
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p><input type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of sheets.</p>		
<p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <li>I <input checked="" type="checkbox"/> Basis of the report</li> <li>II <input type="checkbox"/> Priority</li> <li>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</li> <li>IV <input type="checkbox"/> Lack of unity of invention</li> <li>V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li> <li>VI <input type="checkbox"/> Certain documents cited</li> <li>VII <input checked="" type="checkbox"/> Certain defects in the international application</li> <li>VIII <input checked="" type="checkbox"/> Certain observations on the international application</li> </ul>		
Date of submission of the demand  <b>15/01/2001</b>	Date of completion of this report  <b>19.04.2001</b>	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer  <b>Koch, J-M</b>  Telephone No. +49 89 2399 2979	



# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/02781

## I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):
- Description, pages:**

1-9 as originally filed

### **Claims, No.:**

1-15 as originally filed

### **Drawings, sheets:**

1/3-3/3 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/02781

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

### 1. Statement

Novelty (N)	Yes:	Claims	1-15
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-15
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-15
	No:	Claims	

2. Citations and explanations  
**see separate sheet**

## VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:  
**see separate sheet**

## VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:  
**see separate sheet**

**SECTION V:**

**State of the art:**

The state of the art is given by the document D1 (= WO-A-9816387) which is cited in the application.

**Object of the invention:**

The object of the invention is to provide a screen printing head which enhances shear thinning of the pasty product filled into the apertures of the printing screen and hence improves stencil aperture filling to reduce the incidence of poor quality printing. Furthermore the invention also concerns a screen printing apparatus comprising the said screen printing head and a method of screen printing using the said screen printing head.

**Solution:**

The combination of the following features:

- in independent claim 1: namely especially a flow director disposed in the second chamber and configured such as in use to cause a circulatory flow of pasty product contained therein which passes over the surface of the printing screen and a flow of pasty product towards the printing screen which acts to force pasty product of the circulatory flow towards the printing screen and into apertures therein;
  - in independent claim 14: namely especially a downstream chamber which is subdivided by vanes to define pasty product flow paths along which pasty product will flow as a result of movement of the printing head over the screen in use, the flow paths comprising circulating flow above the wiper blades and flow towards the screen between the vanes as a result of the circulating flows and movement of the pasty product through the exit slot due to the applied pressure;
- is neither disclosed nor suggested in the state of the art.

The same conclusion is also valid for a screen apparatus comprising the printing head of claim 1 (see claim 11), for a method of screen printing using the printing head of claim 1 (see claim 12 and point 2. of Section VIII) and for a method of screen printing using the printing head of claim 14 (see claim 15).

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

---

International application No. PCT/GB00/02781

**SECTION VII:**

1. Claims:

- 1.1 The independent claims have not been cast out in the two-part form, with those features which in combination are part of the prior art (see document D1) being placed into the preamble. They, therefore, do not meet the requirements of Rule 6.3(b) PCT.
- 1.2 Reference signs in parentheses should have been inserted in the claims to increase their intelligibility, Rule 6.2(b) PCT. This apply to both the preamble and characterising portion.

2. Description:

The publication number of document WO-A-90/20088, which is cited at page 2, line 14 of the description, seems to be wrong.

**SECTION VIII:**

1. The various definitions of the invention given in independent device claims 1, 14 and in independent method claims 12, 15 are such that the claims as a whole are not clear and concise, contrary to Article 6 PCT.

Furthermore, the terminology used in the said claims is not uniform (see Rule 10.2 PCT) (see for example: outlet opening - exit slot; second chamber - downstream chamber; circulatory flow - circulating flow).

2. The wording of the method claim 12 does not clearly show that the said method of screen printing uses the screen printing head of any of claims 1 to 10. It is especially not clear that the printing head used in the said method comprises a flow director disposed in the second chamber and configured as defined in claim 1. Furthermore, the previous precision should have been also necessary in order to distinguish the invention from the state of the art, namely the document D1, and in order to fulfil the requirements of Rule 13 PCT (unity of invention).

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

---

International application No. PCT/GB00/02781

3. The expression "along which pass product flows", used in claim 15 (see also page 6, line 20), is not clear.

Probably the said expression should have been "along which pasty product flows".

# PCT

## REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference  
(if desired) (12 characters maximum)

P006791WO KMB

### Box No. I TITLE OF INVENTION

IMPROVEMENTS RELATING TO SCREEN PRINTING

### Box No. II APPLICANT

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)

DEK PRINTING MACHINES LIMITED  
11 Albany Road  
Granby Industrial Estate  
Weymouth  
Dorset, DT4 9TH  
United Kingdom

☐ This person is also inventor.

Telephone No.

Facsimile No.

Teleprinter No.

State (i.e. country) of nationality:

GB

State (i.e. country) of residence:

GB

This person is applicant for the purposes of:

☐ all designated States

☒ all designated States except the United States of America

☐ the United States of America only

☐ the States indicated in the Supplemental Box

### Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)

LAMBERT, Philip John  
5 Pugmill Lane  
Chickerell  
Weymouth  
Dorset, DT3 4PB  
United Kingdom

This person is:

☐ applicant only

☒ applicant and inventor

☐ inventor only (if this check-box is marked, do not fill in below)

State (i.e. country) of nationality:

GB

State (i.e. country) of residence:

GB

This person is applicant for the purposes of:

☐ all designated States

☐ all designated States except the United States of America

☒ the United States of America only

☐ the States indicated in the Supplemental Box

☐ Further applicants and/or (further) inventors are indicated on a continuation sheet

### Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:

☒ agent

☐ common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

BODEN, Dr Keith McMurray et al  
D YOUNG & CO  
21 New Fetter Lane  
London  
EC4A 1DA  
United Kingdom

Telephone No.

+44 20 7353 4343

Facsimile No.

+44 20 7353 7777

Teleprinter No.

☐ Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

See Notes to the request form



**Box No. V DESIGNATION OF STATES**

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

**Regional Patent**

- ☐ **AP** ARIPO Patent: GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SL Sierra Leone, SZ Swaziland, TZ United Republic of Tanzania, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☐ **EA** Eurasian Patent: AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ **EP** European Patent: AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☐ **OA** OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, please specify on dotted line)

**National Patent** (if other kind of protection or treatment desired, specify on dotted line):

- |  |  |
|--|--|
| <input type="checkbox"/> <b>AE</b> United Arab Emirates                  | <input type="checkbox"/> <b>LS</b> Lesotho                                   |
| <input type="checkbox"/> <b>AL</b> Albania                               | <input type="checkbox"/> <b>LT</b> Lithuania                                 |
| <input type="checkbox"/> <b>AM</b> Armenia                               | <input type="checkbox"/> <b>LU</b> Luxembourg                                |
| <input type="checkbox"/> <b>AT</b> Austria                               | <input type="checkbox"/> <b>LV</b> Latvia                                    |
| <input type="checkbox"/> <b>AU</b> Australia                             | <input type="checkbox"/> <b>MA</b> Morocco                                   |
| <input type="checkbox"/> <b>AZ</b> Azerbaijan                            | <input type="checkbox"/> <b>MD</b> Republic of Moldova                       |
| <input type="checkbox"/> <b>BA</b> Bosnia and Herzegovina                | <input type="checkbox"/> <b>MG</b> Madagascar                                |
| <input type="checkbox"/> <b>BB</b> Barbados                              | <input type="checkbox"/> <b>MK</b> The former Yugoslav Republic of Macedonia |
| <input type="checkbox"/> <b>BG</b> Bulgaria                              |  |
| <input type="checkbox"/> <b>BR</b> Brazil                                | <input type="checkbox"/> <b>MN</b> Mongolia                                  |
| <input type="checkbox"/> <b>BY</b> Belarus                               | <input type="checkbox"/> <b>MW</b> Malawi                                    |
| <input checked="" type="checkbox"/> <b>CA</b> Canada                     | <input type="checkbox"/> <b>MX</b> Mexico                                    |
| <input type="checkbox"/> <b>CH AND LI</b> Switzerland and Liechtenstein  | <input type="checkbox"/> <b>NO</b> Norway                                    |
| <input type="checkbox"/> <b>CN</b> China                                 | <input type="checkbox"/> <b>NZ</b> New Zealand                               |
| <input type="checkbox"/> <b>CR</b> Costa Rica                            | <input type="checkbox"/> <b>PL</b> Poland                                    |
| <input type="checkbox"/> <b>CU</b> Cuba                                  | <input type="checkbox"/> <b>PT</b> Portugal                                  |
| <input type="checkbox"/> <b>CZ</b> Czech Republic                        | <input type="checkbox"/> <b>RO</b> Romania                                   |
| <input type="checkbox"/> <b>DE</b> Germany                               | <input type="checkbox"/> <b>RU</b> Russian Federation                        |
| <input type="checkbox"/> <b>DK</b> Denmark                               | <input type="checkbox"/> <b>SD</b> Sudan                                     |
| <input type="checkbox"/> <b>DM</b> Dominica                              | <input type="checkbox"/> <b>SE</b> Sweden                                    |
| <input type="checkbox"/> <b>EE</b> Estonia                               | <input type="checkbox"/> <b>SG</b> Singapore                                 |
| <input type="checkbox"/> <b>ES</b> Spain                                 | <input type="checkbox"/> <b>SI</b> Slovenia                                  |
| <input type="checkbox"/> <b>FI</b> Finland                               | <input type="checkbox"/> <b>SK</b> Slovakia                                  |
| <input type="checkbox"/> <b>GB</b> United Kingdom                        | <input type="checkbox"/> <b>SL</b> Sierra Leone                              |
| <input type="checkbox"/> <b>GD</b> Grenada                               | <input type="checkbox"/> <b>TJ</b> Tajikistan                                |
| <input type="checkbox"/> <b>GE</b> Georgia                               | <input type="checkbox"/> <b>TM</b> Turkmenistan                              |
| <input type="checkbox"/> <b>GH</b> Ghana                                 | <input type="checkbox"/> <b>TR</b> Turkey                                    |
| <input type="checkbox"/> <b>GM</b> Gambia                                | <input type="checkbox"/> <b>TT</b> Trinidad and Tobago                       |
| <input type="checkbox"/> <b>HR</b> Croatia                               | <input type="checkbox"/> <b>TZ</b> United Republic of Tanzania               |
| <input type="checkbox"/> <b>HU</b> Hungary                               | <input type="checkbox"/> <b>UA</b> Ukraine                                   |
| <input type="checkbox"/> <b>ID</b> Indonesia                             | <input type="checkbox"/> <b>UG</b> Uganda                                    |
| <input type="checkbox"/> <b>IL</b> Israel                                | <input checked="" type="checkbox"/> <b>US</b> United States of America       |
| <input type="checkbox"/> <b>IN</b> India                                 |  |
| <input type="checkbox"/> <b>IS</b> Iceland                               | <input type="checkbox"/> <b>UZ</b> Uzbekistan                                |
| <input checked="" type="checkbox"/> <b>JP</b> Japan                      | <input type="checkbox"/> <b>VN</b> Viet Nam                                  |
| <input type="checkbox"/> <b>KE</b> Kenya                                 | <input type="checkbox"/> <b>YU</b> Yugoslavia                                |
| <input type="checkbox"/> <b>KG</b> Kyrgyzstan                            | <input type="checkbox"/> <b>ZA</b> South Africa                              |
| <input type="checkbox"/> <b>KP</b> Democratic People's Republic of Korea | <input type="checkbox"/> <b>ZW</b> Zimbabwe                                  |
| <input type="checkbox"/> <b>KR</b> Republic of Korea                     |  |
| <input type="checkbox"/> <b>KZ</b> Kazakhstan                            |  |
| <input type="checkbox"/> <b>LC</b> Saint Lucia                           |  |
| <input type="checkbox"/> <b>LK</b> Sri Lanka                             |  |
| <input type="checkbox"/> <b>LR</b> Liberia                               |  |

Check-boxes reserved for designating States (for the purposes of a national patent) which have become party to the PCT after the issuance of this sheet:

- ☐ **DZ** Algeria
- ☐ **AG** Antigua and Barbuda
- ☐ **MZ** Mozambique
- ☐ **BZ** Belize

**Precautionary Designation Statement:** In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation (including fees) must reach the receiving Office within the 15-month time limit.)

<b>Box No. VI PRIORITY CLAIM</b>	Further priority claim is indicated in the Supplemental Box <input type="checkbox"/>
----------------------------------	--

Filing Date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country	regional application: * regional Office	international application: receiving Office
item (1) 19 Jul 1999 19/7/1999	9916906.2	GB		
item (2)				
item (3)				

☒ The receiving Office is hereby requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s): (1)

\* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.

### Box No. VII INTERNATIONAL SEARCHING AUTHORITY

**Choice of International Searching Authority (ISA)**  
(If two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):

ISA / EP

**Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority):**

Date (day/month/year)

Number:

Country (or regional Office):

### Box No. VII CHECK LIST; LANGUAGE OF FILING

This international application contains the following number of sheets:

request	3
description (excluding sequence listing part)	9
claims	3
abstract	1
drawings	3
sequence listing part of description	
<b>Total number of sheets</b>	<b>19</b>

This international application is accompanied by the item(s) marked below:

1. ☒ fee calculation sheet
2. ☐ separate signed power of attorney
3. ☐ copy of general power of attorney; reference number, if any:
4. ☐ statement explaining lack of signature
5. ☐ priority documents(s) identified in Box No. VI as item(s):
6. ☐ translation of international application into (language):
7. ☐ separate indications concerning deposited microorganism or other biological material
8. ☐ nucleotide and/or amino acid sequence listing in computer readable form
9. ☐ other (specify):

Figure of the drawings which should accompany the abstract: 6

Language of filing of the international application: English

### Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request)

BODEN, Dr Keith McMurray

For receiving Office use only		2. Drawings:  <input type="checkbox"/> received:  <input type="checkbox"/> not received:
1. Date of actual receipt of the purported international application:		
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:		
4. Date of timely receipt of the required corrections under PCT Article 11(2):		
5. International Searching Authority specified (if two or more are competent): ISA /	6. <input type="checkbox"/> Transmittal of search copy delayed until search fee paid	

Date of receipt of the record copy by the International Bureau:

For International Bureau use only

# PATENT COOPERATION TREATY

PCT

From the RECEIVING OFFICE

To:  
**D Young & Co**  
**21 New Fetter Lane**  
**London**

**EC4A 1DA**

*Received*

## NOTIFICATION OF THE INTERNATIONAL APPLICATION NUMBER AND OF THE INTERNATIONAL FILING DATE

(PCT Rule 20.5(c))

Applicant's or agents's file reference <b>POO6791WO KMB</b>		<b>IMPORTANT NOTIFICATION</b>	
International application No. <b>PCT/GB00/02781</b>	International filing date (day/month/year) <b>19/07/2000</b>	Priority date (day/month/year) <b>19/07/1999</b>	
Applicant <b>DEK Printing Machines Limited et al</b>			
Title of the invention <b>Improvements Relating to Screen Printing</b>			

1. The applicant is hereby notified that the international application has been accorded the international application number and the international filing date indicated above.

2. The applicant is further notified that the record copy of the international application:

- ☒ was transmitted to the International Bureau on 25 July 2000.
- ☐ has not yet been transmitted to the International Bureau for the reason indicated below and a copy of this notification has been sent to the International Bureau\*
- ☐ because the necessary national security clearance has not yet been obtained.

☐ because (reason to be specified):

\* The International Bureau monitors the transmittal of the record copy by the receiving Office and will notify the applicant (with Form PCT/IB/301) of its receipt. Should the record copy not have been received by the expiration of 14 months from the priority date, the International Bureau will notify the applicant (Rule 22.1(c)).

Name and mailing address of the receiving Office The Patent Office Cardiff Road, Newport South Wales NP9 1RH	Authorized officer Sarah Griffin
Facsimile No.	Telephone No. 4383

# PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

## NOTIFICATION OF RECEIPT OF RECORD COPY

(PCT Rule 24.2(a))

SOUTHAMPTON

KMB  
Boden & Co.

To:

BODEN, Keith, McMurray  
D Young & Co.  
21 New Fetter Lane  
London EC4A 1DA  
ROYAUME-UNI

Date of mailing (day/month/year) 24 August 2000 (24.08.00)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference P006791WO KMB	International application No. PCT/GB00/02781

The applicant is hereby notified that the International Bureau has received the record copy of the international application as detailed below.

Name(s) of the applicant(s) and State(s) for which they are applicants:

DEK PRINTING MACHINES LIMITED (for all designated States except US)  
LAMBERT, Philip, John (for US)

International filing date : 19 July 2000 (19.07.00)  
Priority date(s) claimed : 19 July 1999 (19.07.99)  
Date of receipt of the record copy  
by the International Bureau : 10 August 2000 (10.08.00)  
List of designated Offices :

EP : AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE  
National : CA, JP, US

### ATTENTION

The applicant should carefully check the data appearing in this Notification. In case of any discrepancy between these data and the indications in the international application, the applicant should immediately inform the International Bureau.

In addition, the applicant's attention is drawn to the information contained in the Annex, relating to:

- ☒ time limits for entry into the national phase
- ☒ confirmation of precautionary designations
- ☒ requirements regarding priority documents

A copy of this Notification is being sent to the receiving Office and to the International Searching Authority.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. (41-22) 740.14.35	Authorized officer: Eugénia Santos Telephone No. (41-22) 338.83.58
--	--

## INFORMATION ON TIME LIMITS FOR ENTERING THE NATIONAL PHASE

The applicant is reminded that the "national phase" must be entered before each of the designated Offices indicated in the Notification of Receipt of Record Copy (Form PCT/IB/301) by paying national fees and furnishing translations, as prescribed by the applicable national laws.

The time limit for performing these procedural acts is **20 MONTHS** from the priority date or, for those designated States which the applicant elects in a demand for international preliminary examination or in a later election, **30 MONTHS** from the priority date, provided that the election is made before the expiration of 19 months from the priority date. Some designated (or elected) Offices have fixed time limits which expire even later than 20 or 30 months from the priority date. In other Offices an extension of time or grace period, in some cases upon payment of an additional fee, is available.

In addition to these procedural acts, the applicant may also have to comply with other special requirements applicable in certain Offices. **It is the applicant's responsibility** to ensure that the necessary steps to enter the national phase are taken in a timely fashion. Most designated Offices do not issue reminders to applicants in connection with the entry into the national phase.

**For detailed information about the procedural acts to be performed to enter the national phase before each designated Office, the applicable time limits and possible extensions of time or grace periods, and any other requirements, see the relevant Chapters of Volume II of the PCT Applicant's Guide. Information about the requirements for filing a demand for international preliminary examination is set out in Chapter IX of Volume I of the PCT Applicant's Guide.**

GR and ES became bound by PCT Chapter II on 7 September 1996 and 6 September 1997, respectively, and may, therefore, be elected in a demand or a later election filed on or after 7 September 1996 and 6 September 1997, respectively, regardless of the filing date of the international application. (See second paragraph above.)

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

## CONFIRMATION OF PRECAUTIONARY DESIGNATIONS

This notification lists only specific designations made under Rule 4.9(a) in the request. It is important to check that these designations are correct. Errors in designations can be corrected where precautionary designations have been made under Rule 4.9(b). The applicant is hereby reminded that any precautionary designations may be confirmed according to Rule 4.9(c) before the expiration of 15 months from the priority date. If it is not confirmed, it will automatically be regarded as withdrawn by the applicant. There will be no reminder and no invitation. Confirmation of a designation consists of the filing of a notice specifying the designated State concerned (with an indication of the kind of protection or treatment desired) and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.

## REQUIREMENTS REGARDING PRIORITY DOCUMENTS

For applicants who have not yet complied with the requirements regarding priority documents, the following is recalled.

Where the priority of an earlier national, regional or international application is claimed, the applicant must submit a copy of the said earlier application, certified by the authority with which it was filed ("the priority document") to the receiving Office (which will transmit it to the International Bureau) or directly to the International Bureau, before the expiration of 16 months from the priority date, provided that any such priority document may still be submitted to the International Bureau before that date of international publication of the international application, in which case that document will be considered to have been received by the International Bureau on the last day of the 16-month time limit (Rule 17.1(a)).

Where the priority document is issued by the receiving Office, the applicant may, instead of submitting the priority document, request the receiving Office to prepare and transmit the priority document to the International Bureau. Such request must be made before the expiration of the 16-month time limit and may be subjected by the receiving Office to the payment of a fee (Rule 17.1(b)).

If the priority document concerned is not submitted to the International Bureau or if the request to the receiving Office to prepare and transmit the priority document has not been made (and the corresponding fee, if any, paid) within the applicable time limit indicated under the preceding paragraphs, any designated State may disregard the priority claim, provided that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity to furnish the priority document within a time limit which is reasonable under the circumstances.

Where several priorities are claimed, the priority date to be considered for the purposes of computing the 16-month time limit is the filing date of the earliest application whose priority is claimed.

PCT

(PCT Administrative Instructions, Section 411)

To:

BODEN, Keith, McMurray,  
D Young & Co.  
21 New Fetter Lane  
London EC4A 1DA  
ROYAUME-UNI

Date of mailing (day/month/year)  
15 November 2000 (15.11.00)

Applicant's or agent's file reference  
P006791WO KMB

International application No.  
PCT/GB00/02781

International publication date (day/month/year)  
Not yet published

Applicant

DEK PRINTING MACHINES LIMITED et al

## IMPORTANT NOTIFICATION

International filing date (day/month/year)  
19 July 2000 (19.07.00)

Priority date (day/month/year)  
19 July 1999 (19.07.99)

1. The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
2. This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.
3. An asterisk(\*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, **the attention of the applicant is directed** to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
4. The letters "NR" appearing in the right-hand column denote a priority document which was not received by the International Bureau or which the applicant did not request the receiving Office to prepare and transmit to the International Bureau, as provided by Rule 17.1(a) or (b), respectively. In such a case, **the attention of the applicant is directed** to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

<u>Priority date</u>	<u>Priority application No.</u>	<u>Country or regional Office or PCT receiving Office</u>	<u>Date of receipt of priority document</u>
19 July 1999 (19.07.99)	9916906.2	GB	27 Sept 2000 (27.09.00)

**The International Bureau of WIPO**  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.35

Authorized officer

C. Villet

Telephone No. (41-22) 338.83.38

# PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

## NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

To:

BODEN, Keith, McMurray  
D Young & Co.  
21 New Fetter Lane  
London EC4A 1DA  
ROYAUME-UNI

YME DB

Date of mailing (day/month/year) 25 January 2001 (25.01.01)		
Applicant's or agent's file reference P006791WO KMB		IMPORTANT NOTICE
International application No. PCT/GB00/02781	International filing date (day/month/year) 19 July 2000 (19.07.00)	Priority date (day/month/year) 19 July 1999 (19.07.99)
Applicant DEK PRINTING MACHINES LIMITED et al		

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:  
US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:  
CA,EP,JP

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on  
25 January 2001 (25.01.01) under No. WO 01/05592

### REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

### REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. (41-22) 740 14.35	Authorized officer J. Zahra Telephone No. (41-22) 338.83.38
--	---